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Indian Standard

SPECIFICATION FOR CRANE-SUSPENDED LADLES FOR FOUNDRIES

PART 2 CYLINDRICAL GEARED LADLES 0·25 TO 3·0 TONNES FOR IRON FOUNDRIES

(Second Revision)

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NEW DELHI 110002

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Indian Standard

SPECIFICATION FOR CRANE-SUSPENDED LADLES FOR FOUNDRIES

PART 2 CYLINDRICAL GEARED LADLES 0·25 TO 3·0 TONNES FOR IRON FOUNDRIES

(Second Revision)

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SPECIFICATION FOR CRANE-SUSPENDED LADLES FOR FOUNDRIES

PART 2 CYLINDRICAL GEARED LADLES 0·25 TO 3·0 TONNES FOR IRON FOUNDRIES

(Second Revision)

0. FOREWORD

0.1 This Indian Standard (Part 2) (Second Revision) was adopted by the Indian Standards Institution on 27 May 1986, after the draft finalized by the Foundry Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 This standard was first published in 1967 with a view to provide an economic degree of standardization in ladle capacities and dimensions and to ensure that the design and construction provide the maximum efficiency, safety and the minimum of maintenance in iron foundries, and was subsequently revised in 1975.

0.2.1 As a result of experience gained during these years, it has been decided to cover ladles for iron and steel foundries from capacity 0·25 to 50 tonnes in this revision. Depending upon the type, use and capacity, it was found convenient by the Sectional Committee to give more detailed requirements of these ladles in the following four parts of the standard:

Part 1 Straight/taper sided geared ladles 0·25 to 10 tonnes for iron and steel foundries,

Part 2 Cylindrical geared ladles 0·25 to 3·0 tonnes for iron foundries,

Part 3 Straight sided ladles 0·25 to 3 tonnes for SG iron foundries, and

Part 4 Taper sided non-geared ladles 15 to 50 tonnes capacities for iron and steel foundries.

0.2.2 After publication of all the above four parts, IS : 4476-1975* shall be withdrawn.

0.3 This standard (Part 2) covers the lip pouring and tea spout pouring cylindrical geared ladles from capacity 0·25 to 3·0 tonnes for iron foundries. Cylindrical geared ladles offer following advantages over conventional ladles:

a) Better accessibility to the moulds,

b) Serves larger mould area thereby providing greater flexibility of sprue location,

c) Larger ladles can be used in same space,

d) Improves working conditions,

e) Easier spotting of sprue holes,

f) Greater heat retention,

g) Reduces handling costs,

h) Holds metal longer,

j) More metal can be tapped at one time, and

k) Better adapted to purifying operations.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part 2) covers the requirements of cylindrical geared ladles suitable for iron foundries (*see* Fig. 1). Capacity range covered in this specification is 0·25 to 3·0 tonnes. Cylindrical geared ladles may be supplied in the following forms:

a) For lip pouring,

b) With tea spout pouring, and

c) Double lip/tea spout pouring.

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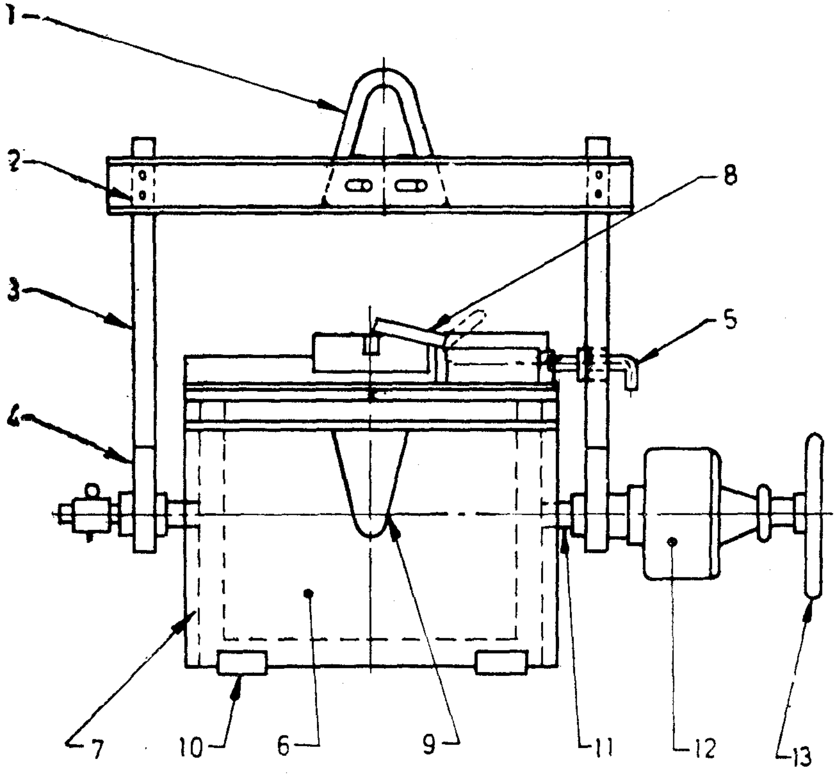
*Specification for crane-suspended hand-operated geared ladles for steel foundries (*first revision*).

†Rules for rounding off numerical values (*revised*).



1. Hook-eye
2. Top members
3. Side members
4. Trunnion carriers
5. Safety catch
6. Cylindrical body
7. Ends
8. Cover plate
9. Pouring lip
10. Feet
11. Trunnions
12. Tilting gear
13. Operating wheel

FIG. 1 CYLINDRICAL GEARED LADLE FOR IRON FOUNDRIES

2. CAPACITIES AND DIMENSIONS

2.1 Ladles covered by this specification shall have capacities specified in Table 1. The capacity of a ladle shall be its liquid iron capacity (excluding slag) when lined.

TABLE 1 CAPACITIES AND REFRACTORY LINING THICKNESSES FOR CYLINDRICAL GEARED LADLES

(*Clause* 2.1)

SL NO.	CAPACITY IN t	MEAN THICKNESS OF REFRACTORY LINING IN mm		HEIGHT OF METAL ABOVE CENTRAL LINE IN mm
		End	Wall	
(1)	(2)	(3)	(4)	(5)
i)	0·25	55	55	70
ii)	0·5	70	70	120
iii)	0·75	85	85	150
iv)	1·0	100	100	150
v)	1·5	100	100	175
vi)	2·0	115	115	175
vii)	3·0	115	115	200

2.2 Table 2 gives the shell dimensions for ladles of given liquid iron capacities. Manufacturers may supply ladles of slightly different dimensions provided that the liquid iron capacities of the ladles are equal to those specified in Table 2. In these tables the density of liquid iron has been assumed to be 6·593 g/ cm^3.

TABLE 2 SHELL DIMENSIONS OF CYLINDRICAL GEARED LADLES

SL NO.	CAPACITY IN t	INTERNAL SHELL DIMENSIONS IN mm	
		Diameter	Length
(1)	(2)	(3)	(4)
i)	0·25	575	625
ii)	0·5	600	750
iii)	0·75	750	825
iv)	1·0	820	890
v)	1·5	890	1 040
vi)	2·0	950	1 170
vii)	3·0	1 040	1 400

3. MATERIAL

3.1 Materials specified in this standard shall comply with the requirements given below:

Material	*Class/Grade and Specification*
Mild steel	IS : 226-1975*
Grey iron castings	Grade FG 200 of IS : 210-1978†
Steel castings	Grade 26-52 of IS : 1030-1982‡
Steel forgings	Class 2 of IS : 2004-1978§
Phosphor bronze	Grade PBZ 10 of IS : 28-1975‖

4. BODY

4.1 The ladle body shall be of mild steel plate and shall be of thickness as specified in Table 3.

4.1.1 The ladle shall be of cylindrical shape. To facilitate relining either a bolted flat top or bolted end plates shall be provided.

4.1.2 The side covers shall be from a single plate. Joints shall not be permitted.

4.1.3 Sufficient number of bolts of suitable size conforming to IS : 1364 (Part 1)-1983¶ shall be provided.

4.1.4 The cylindrical shell of the body shall be constructed by welding on inner as well as outer surfaces, that is, double V-joint.

4.2 The ladle body shall be suitably vented with 6 to 8 mm diameter drilled holes at 250 to 300 mm^2 pitch.

4.3 All welding shall be done in accordance with IS : 816-1969**.

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*Specification for structural steel (standard quality) (*fifth revision*).

†Specification for grey iron castings (*third revision*).

‡Specification for carbon steel castings for general engineering purposes (*third revision*).

§Specification for carbon steel forgings for general engineering purposes (*second revision*).

‖Specification for phosphor bronze ingots and castings (*third revision*).

¶Specification for hexagon head bolts (size range M3 to M36) (*second revision*).

**Code of practice for use of metal arc welding for general construction in mild steel (*first revision*).

4.4 Top Cover — A top cover shall be provided to minimize heat loss. The cover may be of sliding or hinged type. The cover should be lined with refractory.

5. BAIL

5.1 The bail comprising the top and side members and hook-eye shall be so constructed as to permit the ladle to be turned through 360° at its horizontal axis.

5.2 The bail shall be of riveted or bolted construction.

5.2.1 The top member shall be formed of rolled or fabricated steel sections or steel plate, separated by the hook-eye in order to leave an air gap.

5.2.2 The side member shall be either a solid forging or made of rolled steel formed sections and shall be adequately secured. The side members shall be provided with T-heads for load bearing on the top members.

5.3 The trunnion carriers shall be bolted, riveted or welded with the load carrying side member.

5.4 The hook-eye shall be forged from a single piece of steel or fabricated from the plate conforming to IS : 226-1975* and shall be designed and attached to the cross member, so that the load is borne by forging and not by the fastening bolts or rivets. The hook-eye shall be positioned so as to ensure that the ladle is vertical and in balance, when full of molten metal, to its specified capacity.

5.5 The hook-eye shall be sufficiently large to accommodate the lifting hook in use and shall have an adequate factor of safety. The maximum size of lifting hook to be employed shall be specified by the purchaser at the time of enquiry, depending on the crane hook by which the ladle is to be lifted.

6. TRUNNIONS

6.1 Trunnions shall be of steel forgings, steel castings or fabrication. The trunnion shall be riveted, bolted or welded to the end covers with suitable reinforcement.

6.2 The trunnion shall be so located that the ladle is balanced on the trunnion when it is filled to its specified capacity.

6.2.1 If required, the information regarding exact location of the trunnions may be supplied by the manufacturer to the purchaser.

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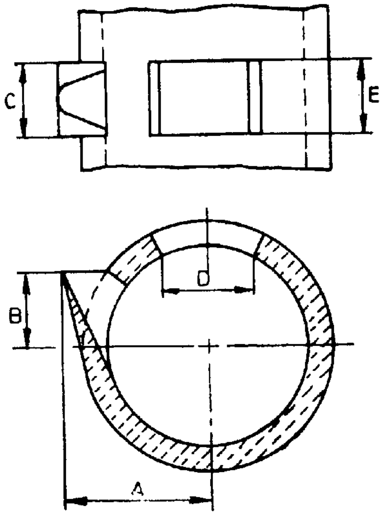
*Specification for structural steel (standard quality) (*fifth revision*).

TABLE 3 SHELL PLATE THICKNESS, DIMENSIONS OF HAND-OPERATED WHEELS, POURING SPOUTS AND TOP-FILLING OPENING FOR CYLINDRICAL GEARED LADLES

(*Clauses* 4.1, 8.6 *and* 9.1)

SL NO.	CAPACITY IN t	SHELL PLATE THICKNESS IN mm		HAND WHEEL DIAMETER IN mm	SPOUT DIMENSIONS IN mm			TOP-FILLING OPENING IN mm		NOMINAL TRUNNION SHAFT DIAMETER IN mm
		End	Body		End of Spout to Body	Height of Spout Above Body	Width of Spout	Width	Length	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
					A	*B*	*C*	*D*	*E*	
i)	0·25	5·0	5·0	460	360	180	190	290	230	60
ii)	0·5	5·0	5·0	460	380	190	200	305	230	60
iii)	0·75	6·0	6·0	460	460	230	200	405	305	60
iv)	1·0	8·0	8·0	460	500	240	200	460	305	70
v)	1·5	8·0	8·0	540	570	240	200	460	305	70
vi)	2·0	10·0	8·0	540	610	340	380	460	380	70
vii)	3·0	12·0	10·0	750	735	380	380	460	380	85



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6.3 The trunnions shall be mounted on antifriction bearings. All bearings shall be suitably sealed against the ingress of extraneous matter with accessibility and adequate provision for lubrication.

6.4 The trunnions shall be protected against metal splashes by a suitable guard.

7. SAFETY CATCHES

7.1 Safety catches shall be provided which, when engaged, prevent movement of the ladle and cross member relative to each other. Safety catch will be required in the horizontal position.

7.2 Safety catches shall be supplied either as hinged forks or as pegs, as specified by the purchaser at the time of enquiry.

7.3 Safety catches shall be so designed as to operate freely and to be readily renewable when distorted on in an unsafe condition.

7.4 Safety catches shall be so located on the side member that, when closed, the forks or pegs are engaged at a distance of not more than 150 mm below the top of the ladle body.

7.5 Additional safety devices may be incorporated by agreement between the purchaser and the manufacturer.

8. TILTING GEAR

8.1 The tilting motion of ladles shall be controlled by suitable gearing, and it shall be in the same direction as the rotation of the handwheel. Back drive from the trunnion should not be possible under loaded ladle conditions.

8.1.1 If a worm gear is used, the worm shall be of steel and the worm wheel of a suitable complementary material.

8.2 The gearing shall run in a sealed container, which may form a grease or oil bath or reservoir. The gearing shall be protected against the ingress of dirt and shall be adequately lubricated in all operating positions. The gearing shall be so designed as to permit movement of the body relative to the side members and cross member only by actuation of the handwheel.

8.3 Unless otherwise specified by the purchaser at the time of enquiry, gear ratio (number of handwheel turns of 360° turn of ladle) shall be left to the discretion of the manufacturer.

8.4 Bearings for all rotating parts shall be readily replaceable irrespective of type.

8.5 All keys shall be secured in such a manner as to prevent them working loose accidentally.

8.6 Hand operating wheels shall be not less than the minimum diameter specified in Table 3.

9. LIP DESIGN

9.1 Lip pouring ladles may be provided with one or two lips as decided by the supplier and the purchaser. The dimensions of the lip are given in Table 3. The purchaser shall specify at the time of enquiry whether the lips are to be welded or bolted to the ladle body. The lip may also be provided off set from centre line to suit the purchaser's requirement.

10. SPOUT FOR TEAPOT-TYPE LADLE

10.1 The material of the spout shall be of the same material and of the same thickness as that of the ladle body. The internal dimensions of teapot spouts are given in Table 4.

11. FEET

11.1 To ensure suitable safety when the ladle, full or empty, is standing on the floor, suitable feet shall be provided.

12. INSPECTION

12.1 If required by the purchaser, for forgings and castings used in the ladles may be radiographically/ultrasonically examined (*see* IS : 2595-1978* and IS : 7666-1975†).

13. MARKING

13.1 Each ladle shall be clearly marked with the manufacturer's name or trade-serial number and the capacity of the ladle along with the term 'Iron' indicating that the ladle is meant for the iron foundry.

13.1.1 The ladle may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

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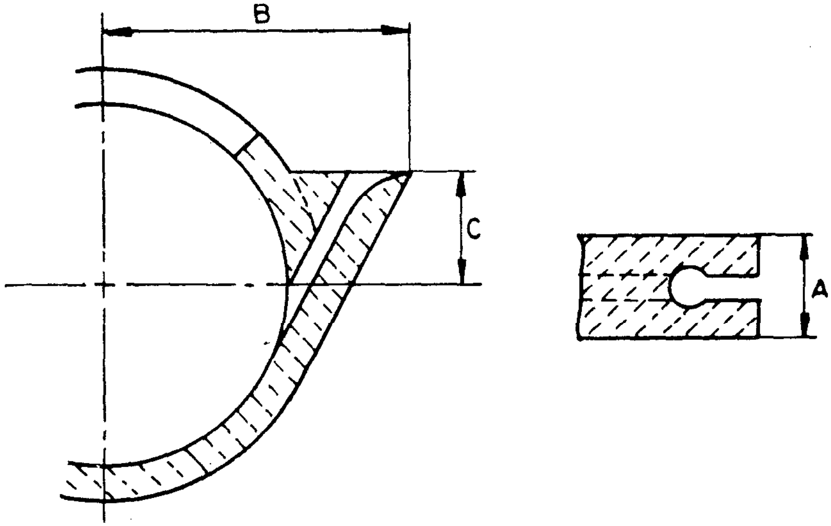
*Code of practice for radiographic testing (*first revision*).

†Recommended procedure for ultrasonic examination of ferrite castings of carbon and low alloy steel.

TABLE 4 INTERNAL SHELL DIMENSIONS OF TEAPOT SPOUTS FOR CYLINDRICAL GEARED LADLES

(*Clause* 10.1)



SL NO.	CAPACITY in t	SPOUT DIMENSIONS IN mm		
		A	*B*	*C*
(1)	(2)	(3)	(4)	(5)
i)	0·25	205	535	190
ii)	0·5	205	535	190
iii)	0·75	205	610	230
iv)	1·0	205	685	240
v)	1·5	205	760	240
vi)	2·0	380	890	345
vii)	3·0	380	1 040	380

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